REMARKS/ARGUMENTS

Please reconsider the application in view of the above amendments and the following remarks. Claims 1-21 are pending in this application. Claim 4 has been amended and Claim 3 has been cancelled.

Claim Amendments

Claim 3 has been canceled since the requirement of a "using a three-dimensional fluid flow model through the reservoir" was previously added to claim 1 by amendment. Claim 4 has been amended to depend from claim 1 rather than claim 3.

Claim Rejections

The Examiner rejected claims 1-8 under 35 U.S.C. § 103(a) as being unpatentable over Curtis (U.S. Patent No. 3,913,398) in view of Stewart (U.S. Patent No. 5,321,612). Claims 9-11 and 12-21 were similarly rejected under 35 U.S.C. § 103(a) as being unpatentable over Curtis in view of Stewart, in further view of Smith (U.S. Patent No. 4,370,886). These rejections are respectfully traversed because the Examiner has failed to present a *prima facie* case of obviousness, as discussed in detail below.

Section 103(a) of the patent statute (35 U.S.C.) states that "[a] patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." In making the assessment of differences, Section 103 specifically requires consideration of the claimed

invention "as a whole." Inventions typically are new combinations of existing principles or features. Envtl. Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 698 (Fed. Cir. 1983) (noting that "virtually all [inventions] are combinations of old elements."). The "as a whole" instruction prevents evaluation of the invention on a piecemeal basis. Without this important requirement, an obviousness assessment might break an invention into its component parts (A + B + C), then find a prior art reference containing A, another containing B, and another containing C, and on that basis alone declare the invention obvious. This form of hindsight reasoning, using the invention as a roadmap to find its prior art components, would discount the value of combining various existing features or principles in a new way to achieve a new result – often the very definition of invention.

Section 103 precludes this hindsight-based discounting of the value of new combinations by requiring assessment of the invention as a whole. The Federal Circuit has provided further assurance of the "as a whole" assessment of the invention under Section 103 by requiring a showing that an artisan of ordinary skill in the art at the time of invention, confronted by the same problems as the inventor and with no knowledge of the claimed invention, would select the various elements from the prior art and combine them in the claimed manner. In other words, a patent examiner or court must show some suggestion or motivation, prior to the applicant's invention, to support a rejection based upon a new combination of prior art references. In re Rouffet, 149 F.3d 1350, 1355-56 (Fed. Cir. 1998).

With reference now to claim 1, the Examiner concludes at page 4 of the Office Action:

> [I]t would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method disclosed by Curtis by calculating the formation fluid temperature by developing a three-dimensional fluid flow model using an estimated formation fluid withdrawal rate, and solving radial heat flux equations in conjunction with the three-dimensional flow model to develop the

> calculated and measured formation fluid temperature versus time profiles to quantify an error between profiles, as taught by Stewart, in order to create a more accurate model and obtain a more accurate predication of the formation temperature.

There has been no identification of a teaching or knowledge in the prior art, however, that the application of a three-dimensional flow model (alleged to be taught by Stewart) to the invention of Curtis would be desirable or even feasible. In fact, it's more likely that the converse is true since: (1) Curtis relies upon a heat transfer model that appears to be two-dimensional in nature and is prominently based upon the two-dimensional parameter of a geothermal gradient G (formation temperature purely as a function of depth); and (2) Stewart itself teaches away from its application to fluid-flow modeling (as discussed below with regard to claim 1). *See, e.g., FIG. 2 and Eq. 7 of Curtis; and col. 6, lines 5-14 of Stewart.*

Moreover, the methodology of Curtis is principally concerned with the determination (by estimation and iterative refinement) of a relaxation distance A, which is useful to determine the mass flow rate of fluid produced from the formation (an objective of Curtis), and whose significance relies upon the geothermal gradient G. *See Abstract and col. 13, lines 8-15 of Curtis.* Accordingly, the relaxation distance A is combined with the geothermal gradient G in the model of Curtis to calculate the temperature of the formation fluid at depth. *See, e.g., Eq. 7 and FIG. 2 of Curtis.* The calculated temperature is compared to a measured formation fluid temperature (e.g., TEMP(DE)), and the relaxation distance A is iteratively adjusted until the difference in the temperatures is favorably minimized. When this occurs, the favorable relaxation distance is used to calculate the production (flow) rate of the formation fluid. *See, e.g., col. 14, lines 23-55 of Curtis.* Thus, the application of a 3-D model to Curtis, whose model is essentially a 2-D model, would lead to uncertain results and possibly render the invention of Curtis unusable. For these

reasons, it is submitted that one skilled in the art would be motivated against combining the teachings of Stewart with Curtis.

Even if the proffered combination of Curtis and Stewart was properly supported, it is not clear that the model of Stewart is capable of satisfying the presently claimed requirement of "calculating a formation fluid temperature at the wellbore *using a three-dimensional fluid flow model through the reservoir*, said calculation based, at least in part, on the estimated static formation temperature" (emphasis added). Stewart describes certain three-dimensional model(s) representing heat flow in subsurface formations. Although analogies between fluid-flow modeling and heat-flow modeling are known, the invention of Stewart is said to capitalize upon a property that is unique to heat flow (dominance of vertical flow compared to horizontal flow), and which does not exist in fluid flow. *See, e.g., col. 6, lines 5-14 of Stewart.* Thus, the invention of Stewart is not suitable for use with the invention of Curtis. Nor is it clear that the 3-D model of Stewart is based – at least in part – upon Curtis's basis for estimating formation temperature (geothermal gradient G; *see col. 11, lines 38-65 of Curtis*), as is presently claimed.

Claim 1 of the present application further recites the step of "comparing the calculated formation fluid temperature at the wellbore with the measured temperature of the *sample* of formation fluid" (emphasis added). The term "sample" is used here in its typical sense, e.g., to mean a representative or finite part of a larger whole. Thus, for example, a sample is preferably collected using a formation testing tool which draws formation fluid via a wellbore wall from a portion of a formation adjacent the wellbore, i.e., essentially from a uniform depth or layer. *See, e.g., Applicants' specification at page 6, lines 10-22.* Such sample-collecting induces a formation fluid-flow regime that is primarily controlled by three-dimensional spherical or radial flow, where the sampling tool functions as a point sink. This realization is related to the 3-D modeling

requirement discussed above.

Curtis, on the other hand, describes the measurement of temperatures, by depth, for formation fluid using a logging instrument disposed within a producing wellbore. Since the production is typically initiated by a plurality of perforations through the wellbore wall (*see perforations 30 in FIG. 1 of Curtis*), the temperature-measured fluid is necessarily a mixture of fluid produced from varying depths or layers of the formation. Thus, the teachings of Curtis would likely produce uncertain and undesirable results if applied to the presently claimed invention. This conclusion is bolstered by the realization that the perforations of the producing wellbore of Curtis are unlikely to accomplish the spherical/radial point sink function achieved through fluid sampling according to the present invention. Additionally the "calculated formation fluid temperature at the wellbore" aspect of this claim limitation is not taught, as discussed above.

It is furthermore submitted that the combination of Curtis and Stewart fails to teach the recited step in claim 1 of: "predicting the static formation temperature by *altering the estimate of the static formation temperature* until an error between the calculated formation fluid temperature at the wellbore and the measured formation fluid temperature is minimized" (emphasis added). This is because Curtis estimates formation temperature according to a geothermal gradient G, as noted above, which is constant. Curtis fails to disclose any updating of the geothermal gradient G. Curtis instead relies on updates of a relaxation distance A, as is clearly indicated in FIG. 3 thereof. This parameter (A) is related to the density, specific heat, and mass flow rate of the flowing formation fluid, and is not indicative of static formation temperature. *See col. 13, lines 1-3 of Curtis*.

In summary, the Applicants respectfully submit that the Examiner has misconstrued the teachings of Curtis and Stewart, and that the proffered combination fails in several instances to disclose the requirements of claim 1. The proffered combination of Curtis and Stewart is further deficient in that it lacks the requisite support in the art, and is therefore based upon improper hindsight reconstruction. For these reasons, claim 1 is submitted to be patentable over the cited art.

Claims 2 and 4-11 each depend from claim 1. Since each of these claims incorporate the limitations of claim 1 by definition, claims 2 and 4-11 are also submitted to be patentably distinct.

Claim 12 includes similar limitations to those described above concerning claim 1, and is therefore submitted to be patentably distinct for the reasons set forth above. Claim 12 further recites the use of a "sink probe" (i.e., formation tester; *see page 5, lines 1-3 of Applicants' specification*) for removing fluid from the formation (see, e.g., the "creating" and "measuring" steps). The Examiner acknowledges that Curtis fails to disclose such a sink probe, and suggests that the addition of a sink probe as taught by Smith to the combination of Curtis and Stewart. This combination is also submitted to be unsupportable because a fluid sampler (i.e., formation tester) would not be usable under the conditions of Curtis: a producing wellbore having no exposed wellbore wall surfaces other than by perforations of irregular size and shape. This practical limitation therefore teaches away from the proffered combination, rather than supporting it. For this reason, claims 12 – and claims 13-16 that depend therefore – are further submitted to be patentably distinct.

Claim 17, as well as claims 18-21 that depend therefrom, recited similar limitations to those discussed above concerning claim 1. Thus, claims 17-21 are also submitted to be patentably distinct over the cited art.

In conclusion, the Applicants submit that all of the pending claims are in condition for allowance. Reconsideration of the claims, withdrawal of the rejections, and passage of the present application to issuance are respectfully requested.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case. Applicant believes this reply to be fully responsive to all outstanding issues and place this application in condition for allowance. If this belief is incorrect, or other issues arise, do not hesitate to contact the undersigned at the telephone number listed below.

This paper is submitted in response to the Office Action dated January 29, 2004 for which the three-month date for response is April 29, 2004. Please apply any charges not covered, or any credits, to Deposit Account 19-0610 (Reference Number 20.2787).

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Respectfully submitted,

Jennie J.L. Salazar, Reg. No. 45,065
Schlumberger Technology Corporation
200 Gillingham Lane, MD 9
Sugar Land, TX 77478
Telephone: (281) 285-8809
Facsimile: (281) 285-8821